REMARKS/ARGUMENTS

Claims 12 and 13 are pending in the application. Claim 12 is deemed withdrawn from consideration by the office action of July 7, 2005. Claim 13 stands rejected by the office action of February 8, 2006. No claims are added, amended or cancelled.

By the office action of February 8, 2006, the examiner has rejected claim 13 under 35 USC 112, first paragraph, as failing to comply with the written description requirement. The examiner states that the claims contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, the examiner states that the originally filed disclosure has no teaching as to the value of v over the claimed temperature range of about (sic, above) 50K and below the Curie temperature. The examiner argues that the specification teaches the value of v at 20K but is silent as to the v values in the claimed range.

The examiner's rejection is respectfully traversed for the following reasons.

The specification discloses a method known in the prior art for determining the properties of the claimed alloy and this known method is not restricted to a specific temperature. The method uses "the numerical scheme proposed in Refs. 7 and 8, which consists of constructing an alloy effective hamiltonian ... to predict the properties of $Pb(Sc_{1-x}Nb_x)O_3$ (PSN) structures. Specification, page 5, paragraph [0013]. References 7 and 8 are Bellaiche, L., Garcia, A. & Vanderbilt, D. Finite-temperature properties of $Pb(Zr_{1-x}Ti_x)O_3$ Alloys from first principles, *Phys. Rev. Lett.* **84**, 5427-5430 (2000) and Hemphill, R., Bellaiche, L., Garcia, A. & Vanderbilt, D., Finite-temperature

properties of disordered and ordered $Pb(Sc_{0.5}Nb_{0.5})O_3$ alloys, *Appl. Phys. Lett.*, **77**, 3642-3644 (2000). Specification, pages 27-8. The total energy of the alloy effective hamiltonian is used in Monte Carlo simulations of a 12 x 12 x 12 supercell to calculate the finite-temperature properties of the alloy. Specification, page 6, paragraph [0014].

The specification teaches that in respect to the claimed alloy "low temperatures yield a rhombohedral structure, increasing temperature leads to a monoclinic structure and for highest values of T below T_c a paralectric phase is observed." Specification, page 23, paragraph [0036]. The specification further teaches that the "huge electromechanical responses" peak around the "orthorhombic-to-monoclinic phase transition." Specification, page 9, paragraph [0017]. Finally, the specification teaches that continuously increasing the v parameter "from 0 to 0.44 leads to a continuous decrease of the orthorhombic-to-monoclinic transition temperature from 373K to 0K and therefore, that the temperature at which [the dielectric and piezoelectric properties] peak depends on the value of the v parameter." Specification, page 9, paragraph [0018].

It is clear then that by simply selecting a value for the v parameter to determine a particular modulated alloy and then by using the known methods of the prior art, one skilled in the art may calculate the properties of the selected alloy as shown in Figs. 3A-3C. The example of Figs. 3A-C (for which the value of v is 0.375) results in a peak in the electromechanical properties of the alloy at 40K. Using the same methods and selecting a value of v above or below 0.375 would allow a similar determination of a temperature at which the peak electromechanical properties occur for that particular value of v. As the specification teaches, there is a direct relationship between the v parameter and the temperature at which the dielectric and piezoelectric properties peak.

Therefore, the teachings of the specification would reasonably convey to one skilled in the relevant art how to determine the value of v over the claimed temperature range of above 50K and below the Curie temperature. Accordingly, the applicants respectfully request that the rejection under 37 CFR 112, first paragraph, based on this first ground of rejection, be withdrawn.

With respect to the Section 112, first paragraph rejection, the examiner also provides a second ground for rejection and states that there is no teaching in the originally filed disclosure as to how to make a lead scandium niobate having the claimed atomic structure and that the statement that this material could be formed by pulse laser deposition (PLD) or MBE (molecular beam epitaxy) does not provide enough information as to the conditions necessary to form the claimed alloy. The examiner also states that it is known in the art that the processing conditions must be controlled otherwise the claimed atomic crystal structure will not form. The examiner concludes that the claimed material was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the application was filed, had possession of the claimed invention.

The examiner's rejection is respectfully traversed for the following reasons.

The specification is not required to teach every detail of the invention, nor is the specification required to teach that which is known to those skilled in the art. Specifically, the specification need only describe how to make the invention without requiring an unreasonable amount of experimentation. The examiner admits that it is known to form structures using PLD or MBE and implies that it is possible to form

crystalline structures if the right conditions apply. The question then is whether undue or unreasonable experimentation would be required to form the claimed alloy.

The attached Declaration under 37 CFR 1.132 of Laurent Bellaiche shows that pulse laser deposition (PLD) and molecular beam epitaxy (MBE) for the formation of layered crystalline materials were well known techniques at the time the present application was filed.

While the examiner states that it is known in the art that the processing conditions must be controlled otherwise the claimed atomic crystal structure will not form, the examiner has not shown that undue or unreasonable experimentation would be required to form the claimed crystalline structure. It is clear from the Exhibits attached to the Declaration that persons skilled in the relevant art routinely engage in experimentation to determine the conditions that produce layered crystalline structures of the type claimed in the present application using pulse laser deposition or molecular beam epitaxy. It is further clear that the conditions for the formation of layered crystalline materials by these techniques are not particularly complex or esoteric. For example, in Exhibit A to the Bellaiche Declaration, the formation of layered $BaTiO_3/SrTiO_3$ is described. The conditions of the formation that are mentioned are the energy density of the laser beam, the temperature, and the ambient atmosphere composition and pressure. There is nothing in this list that suggests that the amount of experimentation that would be required to make the claimed alloy would be unreasonable.

The burden is on the examiner to produce a prima facie case that the experimentation required to make the claimed invention would be unreasonable and the examiner has not carried that burden.

Accordingly, the applicants respectfully request that the rejection under 37 CFR 112, first paragraph, based on this second ground of rejection, be withdrawn.

The applicant submits for the reasons stated above that claim 13 is in condition for allowance. Such action is respectfully requested.

Respectfully submitted,

Date: 5/1/2006

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